NON-PUBLIC?: N
ACCESSION #: 9010100211
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Surry Power Station, Unit 2 PAGE: 1 OF 05

DOCKET NUMBER: 05000281

TITLE: Unit 2 Manual Reactor Trip Following Inadvertent Grounding of the "A" Main Feedwater Regulating Valve Control Signal During Testing
EVENT DATE: 08/27/90 LER #: 90-004-00 REPORT DATE: 09/20/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: M. R. Kansler, Station Manager TELEPHONE: (804) 357-3184

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On August 27, 1990 at 0925 hours, with Unit 2 operating at 100% power, the "A" Main Feedwater Regulating Valve (MFRV) closed following the inadvertent grounding of its control signal during periodic surveillance testing. Closure of the "A" MFRV resulted in a mismatch between "A" Steam Generator (S/G) feedwater flow and steam flow causing several annunciators to alarm. The reactor operator immediately attempted to reopen the "A" MFRV by increasing the controller demand in manual but the valve did not respond. Since a low S/G level coincident with steam flow-feedwater flow mismatch reactor trip was imminent, the reactor operator manually tripped the reactor at approximately 27% level in the "A" S/G. The operators followed appropriate plant procedures and quickly stabilized the unit following the manual trip. A four hour non-emergency report was made to the Nuclear Regulatory Commission in accordance with 10CFR50.72.

END OF ABSTRACT

1.0 DESCRIPTION OF THE EVENT

On August 27, 1990 at 0925 hours, Surry Unit 2 was operating at 100% power when several annunciators alarmed indicating a mismatch between "A" Steam Generator (S/G) feedwater flow and steam flow. The operator observed that the "A" Main Feedwater Regulating Valve (MFRV) (EIIS-FCV) indicated fully closed, that the valve controller (EIIS-JB) had shifted to manual, and that feedwater flow to the "A" S/G had decreased to approximately zero. The reactor operator immediately attempted to reopen the valve by increasing controller demand in manual, but the valve did not respond. Since a low S/G level coincident with steam flow-feedwater flow mismatch reactor trip was imminent, the reactor operator manually tripped the reactor. At the time the reactor was tripped, the "A" S/G level was approximately 27%.

Following the trip, all safety systems functioned as designed with the exception that one Individual Rod Position Indicator (IRPI) (EIIS-ZI) rod bottom bistable light did not illuminate immediately (Control Rod M-10). Additionally, a safety valve (EIIS-RV) located on the Main Steam Reheater (MSR) common drain header between the two first point Feedwater Heaters (FWHs) lifted, which caused a portion of the Turbine Building (TB) fire sprinkler system (EIIS-KP) to actuate on high temperature.

2.0 SAFETY CONSEQUENCES AND IMPLICATIONS

The reactor trip on main steam flow-feedwater flow mismatch coincident with a low water level (20%) in any S/G provides protection against an anticipated loss of normal feedwater. Since the reactor was manually tripped before the automatic setpoint was reached, there was no challenge to the automatic reactor protection system. The Auxiliary Feedwater System functioned as designed to supply water to the S/Gs following the trip.

Emergency Procedures E-0, "Reactor Trip or Safety Injection", and ES-0.1, "Reactor Trip Response" were performed. Step 4 of ES-0.1 requires emergency boration if more than one control rod is not fully inserted. However, since all but one IRPI rod bottom light illuminated within 30 seconds from the reactor trip, emergency boration was not required. Control Rod M-10 rod bottom light illuminated approximately 30 seconds after the reactor was tripped.

Operators quickly realigned secondary systems to depressurize system piping and reseat the FWH safety valve, the affected sprinkler heads replaced and the fire protection system lineup restored with no safety consequences resulting thereof.

Safety related systems and equipment remained operable and plant parameters remained well within the bounds of the safety analysis, therefore the health and safety of the public were not affected.

3.0 CAUSE

The "A" S/G MFRV went shut at 100% power when its controller circuitry was inadvertently shorted during an Emergency Response Facility (ERF) computer multiplexer (MUX) (EIIS-MPX) power supply periodic surveillance test. At the time of the event, a MUX circuit card containing the "A" MFRV control signal was being removed and replaced with an insert extender test card. The test card was being used to measure MUX voltage per the periodic surveillance test procedure. As the card was reinserted, the input to the "A" MFRV controller was shorted, and the valve shifted to manual control and went to zero demand. This resulted in zero output to the valve positioner, causing the MFRV to close. The shorting of the MFRV controller output occurred due to a combination of the wiring configuration used to provide the MFRV control signal input to the General Electric Transient Analysis System (GETARS) computer and the insert extender test card being inserted with the test toggle switch in the "short" position.

The MFRV demand signal input to GETARS was designed to be derived from the resultant voltage drop across a 50 Ohm resistor mounted in the controller module. This resistor is wired in series with the output signal to the MFRV valve electro-pneumatic (E/P) converter (EIIS-CNV). However, the connection between the signal output and common test jacks on the controller effectively bypassed the output signal to the valves when the circuit was shorted. Insertion of the extender test card with the toggle switch in the "short" position caused the 4-20maDC output signal to the E/P converter (EIIS-CNV) to go to zero. The Unit 1 inputs to GETARS were examined and found to be configured as designed. It was determined that the difference in wiring configuration between Unit 1 and Unit 2 was the result of insufficient installation detail in the design documentation which installed the GETARS.

The delay of the IRPI M-10 rod bottom light to illuminate has been evaluated by the Nuclear Steam Supply System vendor to be the result of residual permeability in the control rod drive mechanism housing. This phenomenon is caused by a combination of factors up to and including material composition and reactor coolant system temperature drop following the trip.

4.0 IMMEDIATE CORRECTIVE ACTION(S)

Operators followed appropriate plant procedures and quickly stabilized the unit following the manual reactor trip. The Shift Technical Advisor performed critical safety function status tree reviews to ensure specific plant parameters were within safe bounds.

5.0 ADDITIONAL CORRECTIVE ACTION(S)

All MUX testing was halted, and an investigation was initiated to determine the cause of the MFRV malfunction.

6.0 ACTIONS TO PREVENT RECURRENCE

The Unit 2 control signal inputs to GETARS will be disconnected from the common test jack, and reconnected such that the input is derived from the resultant voltage drop across a resistor, a more fault tolerant configuration and consistent with the installation in Unit 1. Extensive improvements made to the design control program since the GETARS installation design documents were generated should prevent recurrence.

The applicable MUX testing procedures will be changed to specify which MUX cards (those that are monitoring indication inputs only) are allowed to be utilized to perform this testing.

The use of insert extender test cards with shorting switches has been restricted to MUX thermocouple inputs, the only testing which requires the use of a shorting test switch.

A root cause analysis has been initiated to further investigate this event and any additional recommendations to prevent recurrence will be properly dispositioned.

7.0 SIMILAR EVENTS

The following L
Rs describe events where MFRV malfunctions led to
reactor trips.

LER S2-90-003, The MFRV malfunction was due to air blockage in the valve positioner.

LER S2-86-007, The MFRV malfunction was due to metal debris between the plug and valve seat.

LER S2-84-003, The MFRV failed due to broken instrument air supply piping.

LER S1-86-001, The MFRV malfunction was due to a loss of instrument air.

LER S1-86-010, The MFRV malfunction was due to improper maintenance.

8.0 MANUFACTURER/MODEL NUMBER

Westinghouse Electric Corp.
Hagan 7100 Series Control System
Model 124 Controller

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Virginia Electric and Power Company
Surry Power Station
P. O. Box 315
Surry, Virginia 23883

September 20, 1990

U. S. Nuclear Regulatory Commission Serial No.: 90-580
Document Control Desk Docket No.: 50-281
Washington, D. C. 20555 License No.: DPR-37

Gentlemen:

Pursuant to Surry Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following Licensee Event Report for Unit 2.

REPORT NUMBER

90-004-00

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be reviewed by Corporate Nuclear Safety.

Very truly yours,

M. R. Kansler
Station Manager

Enclosure

cc: Regional Administrator
Suite 2900
101 Marietta Street, NW
Atlanta, Georgia 30323

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